Contents

1.0 Purpose/Scope

The purpose of this document is to provide a simple field procedure for operating the *TSI VelociCalc® 8355/8357/8360* air velocity meters. This document shows the user how to use the meter for collecting air flow data. The procedure for operating the *TSI VelociCalc® 8355/8357/8360* is based on information provided in the operation and service manual.

The data collected with this meter may be used to determine acceptable airflow in chemical hoods as well as local exhaust ventilation and HVAC systems.

2.0 Responsibilities

2.1 This procedure will be implemented through the SHSD Industrial Hygiene Group Leader. The IH Group Leader may assign the duties to a Toxic Exhaust Ventilation P*rogram Administrator*. Members of the SHSD Industrial Hygiene Group, the Radiation Control Division Facility Support Group, and Plant Engineering can qualify to perform tasks in this program based on their approval by the line management for the person conducting the measurement. Personnel who have demonstrated competency in performing tasks, in accordance with this procedure, will be qualified to serve as Qualified Sampler. Qualification is documented in Attachment 9.2.

2.2 Data Quality Control procedures: The Qualified Sampler is responsible for the integrity of the data and proper transfer to the IH Group database.

2.3 Hazard Analysis of the Sampling Task: It is the responsibility of the Qualified Sampler and his/her supervisor to ensure that training is current and the appropriate personal protective equipment is worn. In addition, the person performing this procedure and his/her supervisor are responsible to ensure that all required training and qualification for other hazards that may be present in areas (such as respiratory protection or radiation contamination) have been met. The Qualified Sampler and their line supervisor are responsible to comply with all work planning and work permit system requirements.

2.4 The Qualified Sampler is required to request and check the instrument in and out of the IH lab in accordance with the SOP's IH 51200 & 51500.

3.0 Definitions:

Program Administrator: A person designated by the IH Group Leader or SHSD management to administer this procedure and the associated program of toxic exhaust ventilation.

Qualified Sampler: A person who has demonstrated competency in accordance with Section 7 to perform the proper use of this instrument.

4.0 Prerequisites

Training: For SHSD personnel, the SHSD Industrial Hygiene Group Leader, Program Administrator or their designee, will qualify personnel in the use and interpretation of results from the VelociCalc using Attachment 9.2.

5.0 Precautions

5.1 **Hazard Determination:**

5.1.1 This meter may be used in areas where chemical contamination may be present.

These contaminants can have significant health effects and must receive a hazard evaluation by a cognizant ESH professional. This meter does not generate a hazard to the operator or occupants.

5.1.2 Smoke generating devises (eg. candles, matches, etc.) may be used in conjunction with this meter for visual observation of air flow patterns. Although the smoke is hazardous it is typically used in small quantities and controlled by the ventilation system being tested.

5.1.3 Using this procedure does not generate Hazardous Wastes or have negative environmental consequences.

5.1.4 The test equipment design does not cause significant ergonomic concerns in routine use. The meter does not have a noise hazard.

5.2 **Personal Protective Equipment**

5.2.1 Typically, this meter is primarily used for measuring air flow velocity and volume flow rates where there is some risk to the sampler from hazardous chemicals or radiological contamination. Personal Protective Equipment may be needed as appropriate to the task.

5.2.2 The use of smoke generating devices will require eye protection.

6. Procedure

6.1. Equipment: (see Attachment 9.1)

6.2.1. *TSI VelociCalc® 8355/8357/8360* air velocity meters.

6.2.2. Probe with sensors.

6.2.3. (4) AA batteries.

6.2.4. A source of smoke may be required for use with this equipment for visual observation of air flow patterns.

6.3. Inspect the meter

6.3.1. Visually inspect the meter to ensure all parts are working, undamaged and the batteries are good. Each unit has a calibration sticker, which shows the past calibration date and the due date for the next calibration. Do Not Use a meter that is out of calibration.

6.4. Using the Probe

6.4.1. The telescoping probe, mounted on the side of the unit contains the velocity, temperature and humidity sensors (humidity sensor, Model 8360 only). You can use the probe either mounted on the side or hand held. Pulling the probe to extend the tip or pushing it back into the handle moves the wire cable as

well. Do not hold the wire while trying to extend or retract the probe. To extend the probe hold the handle in one hand and pull on the knurled tip with the other. To retract the probe, hold the handle in one hand and push on the probe tip with the other.

6.4.2. When using the probe, make sure the sensor window is fully exposed and the red orientation dot is facing upstream.

6.4.3. The probe is marked in inches for conducting traverse measurements. Make sure all necessary sections of the probe are extended for the depth to be measured.

6.5. Check Units of Measurement

6.5.1. The units of measurement may be changed. Check the units and if you need to change them, please have the IH lab technician make the changes before use.

6.6. Turn the Unit On

6.6.1. Move the power switch on the side of the unit, which is located between the probe brackets. The meter immediately begins an internal self-check. If any problems are encountered the word Cal is shown on the display and the unit should be returned for calibration or adjustment.

6.7. Measuring Velocity

6.7.1. The unit automatically starts in the velocity mode. Make sure the sensor window (tip of probe) is fully exposed and the red orientation dot is facing upstream. When the tip is not visible (eg. Inside a duct) slowly rotate the probe to get the highest reading.

6.7.2. Fluctuating velocity readings mean the probe is in a turbulent flow area. Find another location for testing or adjust the time constant (see Time Constant adjustment later).

6.8. Measuring Flow Rate

6.8.1. Press the FlowRate button on the keypad. If during set up of shape and size you make a mistake, continue to the end of the procedure then start again.

6.8.2. The display shows a rectangle and a circle. Press the Shape Key to select the shape of the duct.

6.8.3. Press Enter to accept the shape and move to the size criteria.

6.8.4. For a circular duct enter the inside ***diameter*** of the duct.

6.8.5. For a rectangular duct the first size is the horizontal width. Use the

Larger/Smaller buttons to adjust the internal duct size to that of the duct being measured. Press enter to accept and move to the vertical size.

6.8.6. Use the larger/smaller buttons to adjust the internal duct size to that of the duct being measured.

6.8.7. Press Enter to accept the vertical size and begin flow measurements. The readings are in cubic feet per minute (ft^3/min).

6.8.8. To make multiple point flow rate measurements, it is necessary to use the store and averaging functions.

6.8.9. Pressing the Store key at any time will store the display reading. Pressing the average key will display the number of readings being averaged (stored values) and then the average Flow Rate. This does not affect the stored data. Additional readings may be stored and averaged into the overall Flow Rate.

6.8.10. Pressing the Clear key on the keypad erases all stored values in the storage register for the current activity. Set the meter in the mode desired and press clear to delete the readings in that mode. Pressing the Clear key in the velocity mode does not affect readings stored in the temperature/humidity/pressure modes.

6.9. Measuring Temperature.

6.9.1. Press the Temperature button on the keypad to select the temperature measurement.

6.9.2. Allow approximately 30 seconds for the temperature sensor to stabilize from the velocity measurement mode.

6.10. Measuring Humidity (8360 only)

6.10.1. On the 8360 model you can press the Humidity button on the keypad to begin measuring relative humidity.

6.10.2. Allow approximately 30 seconds for the sensor to stabilize.

6.10.3. The humidity sensor is sensitive to the effects of water. Do Not Expose the sensor to liquid water at temperatures higher than 104 ^oF (400^oC), or accuracy will be affected. Exposure to liquid water at room temperature must be limited to 3 minutes or less. If the humidity sensor becomes wet, shake it off and lightly blow on the sensor to dry. Do Not Apply Heat to the sensor to dry it.

6.11. Measuring Dew Point (8360 Only)

6.11.1. Press the Dew Point button on the keypad. Allow approximately 30 seconds for the sensor to stabilize.

6.11.2. There is not a separate sensor for reading Dew Point. It is calculated from

the temperature and humidity readings. Accuracy is affected by temperature and humidity and the readings are most accurate when humidity is at or above 50%. See caution above regarding the effects of water on the humidity sensor.

6.12. Measuring Pressure (8360 Only)

6.12.1. The pressure ports on the back of the unit are labeled + and – as well as color coded.

6.12.2. To zero the pressure reading leave the ports open (no tubing) and press and hold the Pressure key for 3 seconds. A double beep will be heard and the display will read “0 in. H20” (or whatever units have been selected).

6.12.3. Do Not expose the unit to overpressure (300 in. H20 (75 kPa, 560 mmHg) otherwise the pressure sensor will burst.

6.12.4. Attach the blue tubing to the blue port and this will be the positive pressure tube.

6.12.5. The clear tubing is attached to the colorless port and is the negative pressure tube.

6.12.6. Press the Pressure Key on the keypad. The display will read in pressure terms (in. H20; kPa; or mmHg).

6.13. Selecting the Time Constant

6.13.1. The time constant Key on the keyboard may be adjusted when velocity, flow rate or pressure levels are fluctuating. The meter takes a reading every second and remembers the last 20 readings. Depending on the time constant a certain number of these readings are used for averaging. For instance, if the time constant is set to 5, the newest 5 readings are averaged together and the other 15 readings are ignored.

6.13.2. Check the Time Constant by pressing the Time Constant key and release it as soon as the first value is displayed. The current Time Constant is always displayed first.

6.13.3. Use the Time Constant key to set the reading to 1, 5, 10, 15, or 20 seconds. Press and hold the Time Constant key until the desired time constant is displayed then release the key.

6.13.4. Displayed values are not accurate until at least one time constant has elapsed.

6.14. AC Adapter

6.14.1. The AC adapter allows the meter to run with or without batteries. This is not

a battery charger.

7.0 Implementation and Training

7.1 Testing shall be performed only by persons who have demonstrated competence to satisfactorily perform the tests as evidenced by experience and training. The qualification to use this procedure, demonstration of competency, and qualification is documented using Attachment 9.3 Job Performance Measure. All persons must have met the qualification criteria set in IH50300 *BNL IH Program and IH Group Training & Qualification Matrix.*

7.2 Qualification Frequency & Recordkeeping: The supervisor of *Qualified Samplers* is responsible to ensure that the employees remain competent in the operation of this meter.

- Personnel are re-qualified when there is evidence that they do not clearly understand the principles of operation of this meter.
- The re-qualification frequency is 3 years. However, if a person has not used this instrument for a period of over 12 months from the date of last qualification, demonstration of competency to perform this procedure to the satisfaction of the supervisor may be required before sampling commences.
- If significant and substantive changes to the procedure are made, *Qualified Samplers* will be notified of the changes.

8.0 References

8.1 TSI Incorporated Operation and Service Manual Model 8355/8357/8360 VelociCalc Air Velocity Meter.

9.0 Attachments

9.1 Photograph of meter
9.2 *Job Performance Measure*

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH62680** REVISION **Final Rev1**
SUBJECT: INSTRUMENT OPERATION **TSI VelociCalc® 8355/8357/8360 Air Velocity Meters Operation**	DATE **10/31/05** PAGE **8** OF **10**

10.0 Documentation

Document Development and Revision Control Tracking		
Prepared By: *(signature/date on file)* J. Peters 4/26/05 Certified Industrial Hygienist	Reviewed By / Date: *(signature/date on file)* R. Selvey 4/28/05 Certified Industrial Hygienist	Approved By / Date: *(signature/date on file)* R. Selvey 04/28/05 Industrial Hygienist Group Leader
ESH Coordinator/ Date: *none*	Work Coordinator/ Date: *none*	SHSD Manager / Date *none*
QA Representative / Date: *none*	Training Coordinator / Date: none	Filing Code: **IH52.05**
Facility Support Rep. / Date: *none*	Environ. Compliance Rep. / Date: *none*	Effective Date: **04/30/05**
ISM Review - Hazard Categorization ☐ High ☐ Moderate ☒ Low/Skill of the craft	Validation: ☐ Formal Walkthrough ☒ Desk Top Review ☐ SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 10/31/05 Hard Copy files updated: 10/31/05

Revision Log		
Purpose: ☐ Temporary Change ☐ Change in Scope ☒ Periodic review ☒ Clarify/enhance procedural controls Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above Section/page and Description of change: Revised Section 7 training requirements. Updated Section 10 to new format.		
*(signature/date on file) R. Selvey **10/31/05*** SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER IH62680
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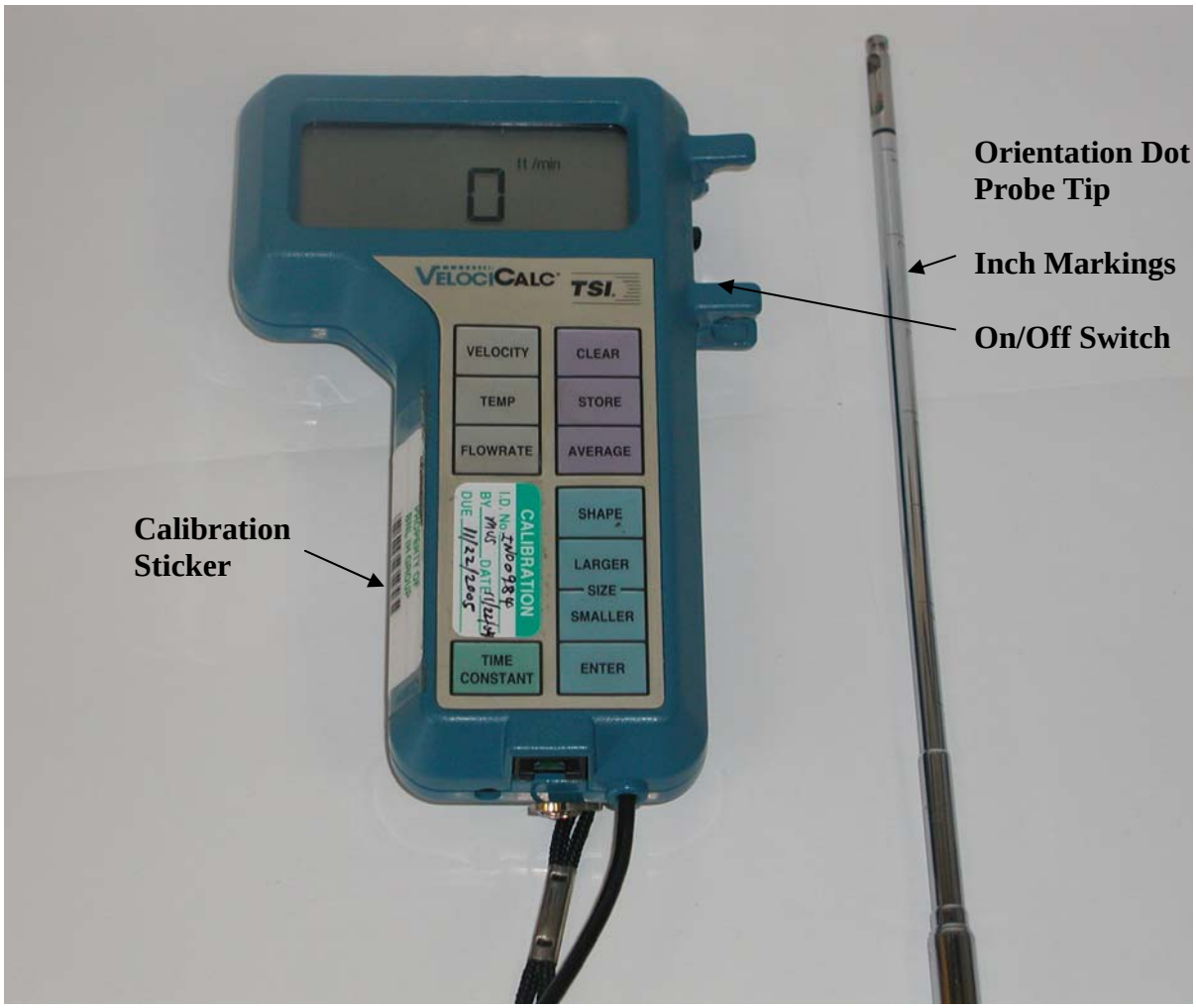
Attachment 9.1

Photograph of the VelociCalc



BROOKHAVEN NATIONAL LABORATORY

IH62680 Attachment 9.2

HP-IHP-62680

Environmental, Safety, Health & Quality Directorate
SHSD Industrial Hygiene

Operation of the TSI VelociCalc® 8355/8357/8360 Air Velocity Meters

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Knowledge of the Principles of IAQ Investigations

Criteria	Qualifying Standard	Unsatis-factory	Recov-ered	Satisf-.actory
Hazard Analysis	Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.			
Personal Protective Equipment	Understands the need to be aware of potential exposures to the sampler and how to determine appropriate PPE.			
Sampling Protocol	Understands the ventilation system design parameters and logic necessary to appropriately select sampling locations for accurate measurements.			
Analysis of data	Understands the need to perform analysis on the sampling data to assess the effectiveness of the ventilation system and potential exposure to the sampler, worker, public and environment. Also, to recommend corrective actions as necessary.			

Practical Skill Evaluation: Demonstration of Sampling Methodology

Criteria	Qualifying Performance Standard	Unsatis-factory	Recov-ered	Satisf-.actory
Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
Meter Operation	Demonstrates the proper way to set up, turn on and use the meter.			
Record forms	Shows how to correctly and completely fill all forms associated with this SOP.			
Data Analysis	Knows the correct criteria and operating ranges. Shows how to correctly analyze data and compare to acceptable criteria.			
Report preparation and distribution	Knows how to document the assessment and the correct distribution.			

Employee: I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

Evaluator: I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: